

University Entrance, Bursaries and Scholarships Examination

PHYSICS 2000

Marking Schedule and Examination Commentary

GENERAL COMMENTS

This was a similar paper to recent years though slightly easier for well prepared students, enabling them to score more than 140 points. In order to separate out scholarship candidates, most questions were more demanding towards the end. As with recent years, the paper was contextual and with a mixture of descriptive, algebraic and graphical questions. Almost all candidates finished the paper, apparently with sufficient time in hand.

Questions requiring descriptive responses were better handled than in previous years. As with 1999 there was an apparent erratic score distribution within individual candidate's answers, suggesting that some parts of the course were less familiar to some candidates.

The use of correct units was much improved on last year and generally handled very well by all candidates. The mean score for units was 2 out of 4. However, significant figures were still not done well and many candidates had lost all four marks by the end of question 1. Most had lost all four by the end of the paper. The mean was 1 out of 4.

Legibility of answers was less of a problem than last year. However candidates should be reminded that it is not the marker's job to have to decipher illegible numbers or writing. Clarity in answers given by candidates is essential. Pencil was often used in diagrams and in some cases for entire scripts. Pencil should not be used as it means reconsideration of answers by candidates is not possible.

Electricity and magnetism appeared to be the weaker areas for many candidates. Over the past three years the mean for the Electricity and Magnetism sections has dropped from 57 % in 1998 to 44 % in 2000.

Questions of the 'show that' type were still generally poorly done, candidates often starting out well but leaving the intermediate steps for the marker to work out.

COMMENTS ON SPECIFIC QUESTIONS

Note: the mean mark in each case has been obtained from a sample of papers and is unscaled.

Question One: Rotational Motion (mean 12.2/16)

As with 1999, Question One was relatively straightforward, intended to settle candidates into the examination.

- (a) Generally well done by all candidates.
- (b) and (c) Generally well done.
- (d) Done well by many but it was common to assume constant angular velocity.
- (e) and (f) Many failed to express themselves clearly and simply. The skill of constructing meaningful sentences must be practised.
- (g) Generally well done.
- (h) There were a number of candidates who wrote $KE = \frac{1}{2}I\omega^2$ and then failed to square ω in the calculation.

Question Two: Linear and Rotational Forces (mean 4.2/8)

- (a) Many candidates tried to apply momentum arguments, but since only 1 mark was available no calculation was required at all.
- (b) Most candidates came up with $F = m\Delta v/\Delta t$ arguments but substituted the wrong m or wrong velocity values.
- (c) This was clearly a difficult question. Many candidates worked backwards to get to the right answer. Many forgot that it was the combined mass of 40 kg that was accelerating.
- (d) Mostly done well with kinematic formula.

Question Three: Simple Harmonic Motion (mean 8.8/14)

- (a) Almost all candidates used the correct formula and substituted correctly.
- (b) Most chose 'less'.
- (c) This proved to be a difficult graph to draw. Most could get the amplitude to decrease correctly or the period to stay the same but not both. A significant number had too many cycles drawn in.
- (d) Well done by most candidates.
- (e) Well done by most. Algebraic manipulation skills appeared to be better than in recent years.
- (f) Many reached the stage of obtaining 49° but then could go no further. A few candidates used an SHM formula and so only earned at the most 1 mark. Many candidates were obviously confused by a clockwise rotating phasor.

- (g) This graph was generally drawn well, but some candidates had clearly never come across the idea of forced SHM.

Question Four: Gravity and Circular Motion
(mean 7.9/14)

The gravity question was clearly more straightforward than in recent years.

- (a) Done well by most.
 (b) and (c) Done well.
 (d) Although many different answers were acceptable here, the question was in general poorly answered. The question may not have been specific enough for many candidates. The distinction between speed and angular speed was often confused.
 (e) It was very disturbing to see many candidates unable to deal with the 1000 or the 3600 in the calculation required for this question.
 (f) Poorly done, mainly because candidates had a resultant vector drawn and a centripetal force vector drawn, giving twice as much force towards the centre.
 (g) Many used sin instead of tan so few gained full marks here.

Question Five: DC Electricity (mean 4.0/10)

Parts of this question were very poorly done. Candidates' ideas about current and voltage showed a very real lack of solid understanding.

- (a) This question was done well by the majority of candidates. A common mistake was to treat the three components as being in parallel and then proceed to evaluate the equivalent resistance. Many candidates incorrectly stated that $\frac{1}{2} + 1/0.12 = 8.8333 = 0.1132\Omega$. Mathematical rigour was lacking in many cases and needs to be addressed for such calculations.
 (b) This question was answered correctly by most candidates.
 (c) It appears from this part of the question that internal resistance is not well understood. The question could have been answered by simply following the reasoning from (a) and (b). Over 20% of candidates gave an answer greater than 12 V.
 (d) This question was very poorly done indeed. About 95% of candidates scored no marks. Most assumed that only a finite current was available and that engaging the starter motor diverted that current from the headlights. It is very disturbing that most candidates had a poor understanding of current and voltage.

Question Six: Capacitance (mean 5.9/13)

This was another difficult question. A number of candidates appeared to give up half way through.

- (a) Generally well done, but as with Q5 (a), was often lacking in mathematical correctness.
 (b) The wrong capacitance was often chosen here. However, nearly all candidates chose the correct equation.
 (c) Generally well done but lack of prefix manipulation produced some unrealistic solutions.
 (d) Very few candidates were able to do the calculations for this question. Two steps were involved, firstly recognising that the total charge was twice that in (c) and secondly that only $\frac{2}{5}$ of the charge would be on the $2\ \mu\text{F}$ capacitor.
 (e) Generally well done, except by those candidates who tried to use $C = \epsilon_r \epsilon_0 A/d$. Units were regularly included here, incorrectly.
 (f) This was a straightforward question and was generally done well.
 (g) Many candidates identified a 37% drop instead of 63%.

Question Seven: Inductance (mean 4.7/9)

Many candidates scored full marks for this question and about the same number of candidates scored zero, often by omitting the entire question.

- (a) This was generally well done. A common mistake was to try to include 0.47 H as a resistance.
 (b) and (c) There was a reasonable amount of confusion about which graph should be where. Note that a decreasing exponential must start on the y-axis and graphs must **not** touch asymptotes.
 (d) This was well done.

Question Eight: AC Electricity (mean 6.5/15)

Approximately 10% of candidates did not attempt this question at all. As with the 1999 examination, it appears that many schools do not cover AC electricity in sufficient detail for candidates to be confident to answer University Bursaries level questions.

- (a) Many candidates obtained the correct answer but appeared confused about impedance.
 (b) The confusion between resistance and impedance was demonstrated here also.
 (c) Generally done well. The expression for f_0 , which is not in the formula sheet, has clearly been memorised by many candidates.
 (d) A large number of candidates misunderstood this question and answers were confused.
 (e) Most candidates drew phasor diagrams and many of these showed the capacitor and inductor voltages

to be the same length. However, quite a few candidates drew sinusoidal curves of varying phases, suggesting that they had not read the question correctly.

- (f) Not well done. Most candidates showed no appreciation of the connection between phasor diagrams and the resulting phase angle if a variable is changed.
- (g) Many candidates showed smoothing here, when there was no capacitor.

Question Nine: Sound (mean 9.6/13)

- (a) Generally done well.
- (b) Generally done well, but some candidates still confused the speed of light with the speed of sound.
- (c) Many candidates forgot the second value.
- (d) Well done, and a much easier doppler question than in recent years.
- (e) Many forgot to double the distance. Significant figures were poorly done in this question.
- (f) Many answers were accepted here but often candidates had the frequency changing. Candidates did not need to know whether the speed increased or decreased in denser water.

Question Ten: Electromagnetic Radiation (mean 9.2/15)

- (a) Well answered by most candidates although quite a few gave the answer to only 1sf.
- (b) Well answered by most candidates.
- (c) The wording of the question had many candidates confused.
- (d) and (e) Well answered by most candidates.
- (f) Candidates were not confused by the different units given in the Question Booklet and Answer Booklet (lines per centimetre and lines per metre).

Question Eleven: Atomic Physics (mean 5.6/12)

- (a) Well done by most candidates.
- (b) Not as well done. Some candidates used $E = mc^2$, while some gave the speed of light.
- (c) It appeared that many candidates simply guessed here.
- (d) Many varied explanations and calculations, but in general not well done.
- (e) Very few candidates calculated ΔE , or simply calculated E for level 4 and assumed $E = 0$ in the ground state.
- (f) Well done by most candidates.

Question Twelve: Nuclear Physics (mean 7.2/13)

Although better than in 1999, this question was still surprisingly poorly done.

- (a) Generally well done.
- (b) Most candidates chose the correct equation but some were unable to apply it.
- (c) Poorly done by many candidates. Converting MeV to Joules must be learned, rather than substitute into a given formula.
- (d) Poorly done by many candidates.
- (e) Well done based on answers to (c) and (d).
- (f) Many guessed that the difference was insignificant but were unable to give any reasonable explanation of why.

MARKING SCHEDULE

Question One: Rotational Motion (16 marks)

(a) $\frac{4100}{60} \times 2\pi$ (1 mark)
 $\times 2\pi$ (1 mark)

= 429.351 rads⁻¹

(b) $T = \frac{1}{4100} \times 60$ (1 mark)
 = 0.0146 s rev⁻¹ (1 mark)

or $T = \frac{2\pi}{\omega}$ (1 mark)
 = 0.0146 (1 mark)
 = 0.015 s (1 mark)

(c) $v = \frac{2\pi r}{T}$ (1 mark)
 $= \frac{2\pi \times 0.23}{0.0146}$ (1 mark)
 = 98.98 (1 mark)
 = 99 (or 96) ms⁻¹ (1 mark)

(d) $\theta = \frac{\omega_i + \omega_f}{2} \times t$ (1 mark)
 $= \frac{(430 + 0)}{2} \times 4.5$ (1 mark)
 = 967.5 (1 mark)
 = 970 rad (or 55 000°) (1 mark)

(e) $I = (\Sigma)mr^2$, or state that if r is large then I is large (1 mark)
 For stating increase in I (1 mark)

(f) $T = I\alpha$ (1 mark)
 or 'for a given torque' if I is large then α is small.
 If α is small then change in rotational velocity is small (1 mark)
 (or 2 marks for a conservation of angular momentum argument)

(g) $L = I\omega$ (1 mark)
 $I = \frac{L}{\omega}$ (1 mark)
 $= \frac{120}{302}$ (1 mark)
 = 0.397
 = 0.40 (kg m²)

(h) $KE = \frac{1}{2}I\omega^2$ (1 mark)
 $= \frac{1}{2} \times 0.40 \times (302)^2$
 $= 1.8 \times 10^4$ J (1 mark)

Question Two: Linear and Rotational Forces (8 marks)

Part 1

(a) 4.2 ms⁻¹ (1 mark)

(b) $F = ma$ (1 mark)

$= m \times \frac{\Delta v}{\Delta t}$
 $= m \times \frac{|v_2 - v_1|}{t}$

$= \frac{18(2.5)}{0.5}$ (1 mark)
 = 90 N (1 mark)

or momentum argument (2 marks)

Part 2

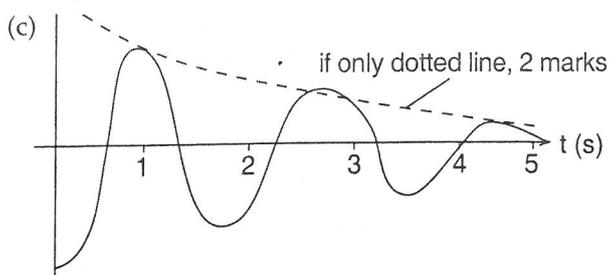
(c) $a = \frac{F}{m}$ (2 marks)
 $= \frac{(21 - 19)9.8}{19 + 21}$
 $= \frac{19.6}{40}$
 = 0.49 ms⁻²

(d) $d = v_1 t + \frac{1}{2}at^2$ (1 mark)
 $= 0 + \frac{1}{2} \times 0.49 \times 1.5^2$ (1 mark)
 = 0.55 (or 0.56)m (1 mark)

Question Three: Simple Harmonic Motion (14 marks)

(a) $T = 2\pi\sqrt{\frac{m}{k}}$ (1 mark)
 $= 2\pi\sqrt{\frac{145}{1700}}$ (1 mark, or 2 if equation implied)
 = 1.83501 s

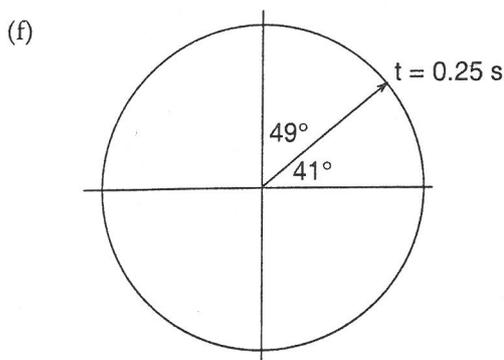
(b) less (1 mark)



1 mark for shape, 1 mark for 2.5 to 3.5 oscillations (2 marks)

(d) $E = \frac{1}{2}kx^2$ (1 mark)
 $= \frac{1}{2} \times 1700 \times (0.11)^2$
 $= 10.285$
 $= 10 \text{ J}$ (1 mark)

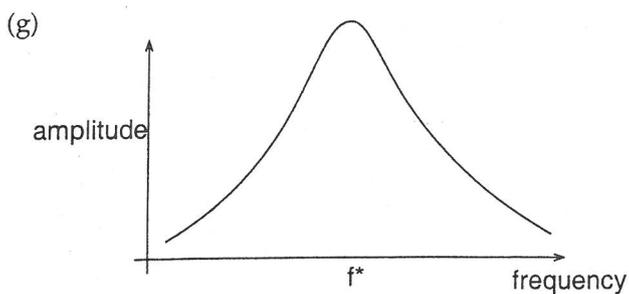
(e) $KE = 10.285$ (1 mark)
 $= \frac{1}{2}mv^2$ (or $v = A\omega$)
 $v^2 = 2 \times \frac{10.285}{145}$
 $v = 0.3766$
 $= 0.38$ (or 0.37) ms^{-1} (1 mark)



$\frac{0.25}{1.83501} = 49^\circ$ or 0.856 rad (1 mark)

$\cos(41) = \frac{x}{0.11}$ (1 mark)

$x = 0.083 \text{ m}$ (1 mark)



1 mark for shape, 1 mark for labels correct on axes (2 marks)

Question Four: Gravity and Circular Motion (14 marks)

Part 1

(a) $F = mg$
 $= 85 \times \frac{1}{2} \times 9.8$ (1 mark)
 $= 416.5$
 $= 420 \text{ N}$ (1 mark)

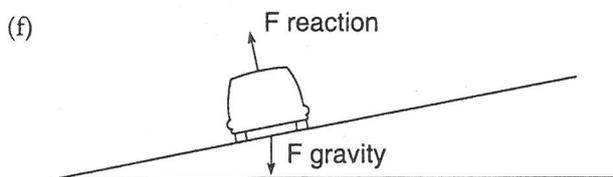
(b) $F_c = \frac{mv^2}{r}$ $a_c = \frac{v^2}{r}$ (1 mark)
 $\frac{1}{2}(9.8) = \frac{v^2}{350}$ (1 mark)
 $v = 41.4126 \text{ ms}^{-1}$

(c) $T = \frac{2\pi r}{v}$
 $f = \frac{v}{2\pi r}$ (1 mark)
 $= \frac{41.4126}{2\pi \times 350}$
 $= 0.0188$
 $= 0.019 \text{ Hz}$ (1 mark)

(d) Gives a reasonable "g" (1 mark)
 without too high a rotational frequency (1 mark)
 or more I, more stable (2 marks)
 or reasonable physics explanation (2 marks)

Part 2

(e) $\frac{105}{3600} \times 1000$ (1 mark)
 $= 29.2 \text{ ms}^{-1}$ (1 mark)



F_{gravity} 1 mark
 F_{reaction} 1 mark
 minus 1 mark if $F_{\text{centripetal}}$ drawn in also. (2 marks)

(g) $\tan \theta = \frac{mv^2}{r} \div mg$ (1 mark)
 $= \frac{v^2}{rg}$ $\theta = \tan^{-1} \left(\frac{v^2}{rg} \right)$
 $= 16.976^\circ$
 $= 17^\circ$ (0.30 rad) (1 mark)

Question Five: DC Electricity (10 marks)

$$(a) \quad R_T = 0.10 + \frac{1}{\left(\frac{1}{2} + \frac{1}{0.12}\right)} \quad (1 \text{ mark})$$

$$= 0.10 + 0.113208 \quad (1 \text{ mark})$$

$$= 0.213208 \, \Omega \quad (1 \text{ mark})$$

$$(b) \quad I = \frac{V}{R} \quad (1 \text{ mark})$$

$$= \frac{12}{0.213208} \quad (1 \text{ mark})$$

$$= 56.28 \quad (1 \text{ mark})$$

$$= 56 \text{ A} \quad (1 \text{ mark})$$

$$(c) \quad V = 12 - V_{R_i} \quad (1 \text{ mark})$$

$$= 12 - (56.28 \times 0.10) \quad (1 \text{ mark})$$

$$= 12 - 5.628 \quad (1 \text{ mark})$$

$$= 6.372 \quad (1 \text{ mark})$$

$$= 6.4 \text{ V} \quad (1 \text{ mark})$$

(d) More current means more voltage lost across the internal resistance (1 mark)
and so less voltage appearing at the battery terminals. (1 mark)

$$(d) \quad Q_T = 2 \times 6.6 \times 10^{-5} \quad (1 \text{ mark})$$

$$= 1.32 \times 10^{-4} \text{ C}$$

$$\text{proportion on } 2.0 \, \mu\text{F} = \frac{2}{5}$$

$$= 5.28 \times 10^{-5}$$

$$= 5.3 \times 10^{-5} \text{ C} \quad (1 \text{ mark})$$

$$(e) \quad \epsilon_r = \frac{2.6 \times 10^{-11}}{2.0 \times 10^{-11}} \quad (1 \text{ mark})$$

$$= 1.3 \quad (1 \text{ mark})$$

$$(f) \quad R = \frac{V_{\max}}{I_{\max}} \quad (1 \text{ mark})$$

$$= \frac{55}{0.125} \quad (\text{accept } 0.123, 0.124) \quad (1 \text{ mark})$$

$$= 440 \, \Omega$$

$$(g) \quad \tau = RC$$

$$C = \frac{\tau}{R}, \text{ from graph } \frac{0.124}{e}$$

$$\tau \sim 0.145 \text{ s} \quad (1 \text{ mark})$$

$$C = \frac{0.145}{443}$$

$$= 3.3 \times 10^{-4} \text{ F (290 to } 350 \, \mu\text{F)} \quad (1 \text{ mark})$$

(or energy argument giving 290 – 350 μF , 2 marks)

Question Six: Capacitance (13 marks)

$$(a) \quad \frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} \quad (1 \text{ mark})$$

$$= \frac{1}{2} + \frac{1}{3}$$

$$= \frac{5}{6}$$

$$C_T = \frac{6}{5} \quad (1 \text{ mark})$$

$$= 1.2 \times 10^{-6} \text{ F}$$

$$(b) \quad Q = C \times V \quad (1 \text{ mark})$$

$$= 1.2 \times 10^{-6} \times 55$$

$$= 6.6 \times 10^{-5} \text{ C} \quad (1 \text{ mark})$$

$$(c) \quad V = \frac{Q}{C} \quad (1 \text{ mark})$$

$$= \frac{6.6 \times 10^{-5}}{2 \times 10^{-6}} \quad (1 \text{ mark})$$

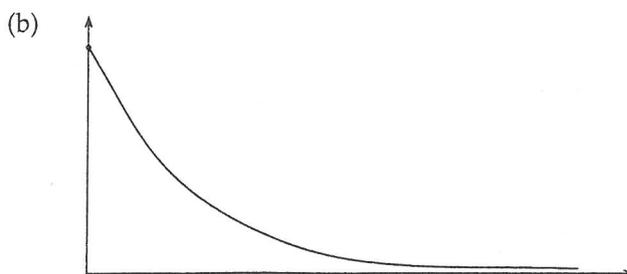
$$= 33 \text{ V} \quad (1 \text{ mark})$$

Question Seven: Inductance (9 marks)

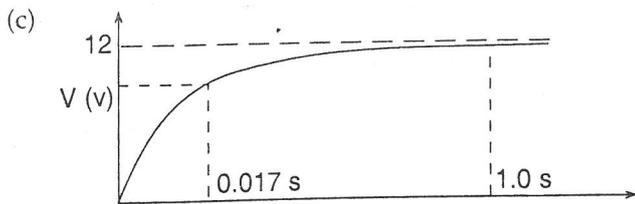
$$(a) \quad I = \frac{V}{R} \quad (1 \text{ mark})$$

$$= \frac{12}{2.7}$$

$$= 4.4 \text{ A} \quad (1 \text{ mark})$$



1 mark for shape, 1 mark for touching y axis and asymptote to x axis. (2 marks)



1 mark for shape, 1 mark for 12 V asymptote,
1 mark for 0.17 s at one time constant or 1.0 s
at ~ 5 time constants (3 marks)

(d) $E = \frac{1}{2} LI^2$ (1 mark)
 $= \frac{1}{2} 0.47(4.44)^2$
 $= 4.64$
 $= 4.6(4.5) \text{ J}$ (1 mark)

Question Eight: AC Electricity (15 marks)

(a) $Z = \frac{V}{I}$ (1 mark)
 $= \frac{24}{0.060}$
 $= 400 \Omega$ (1 mark)

(b) at resonance $Z = R$, $R = 400 \Omega$ (1 mark)

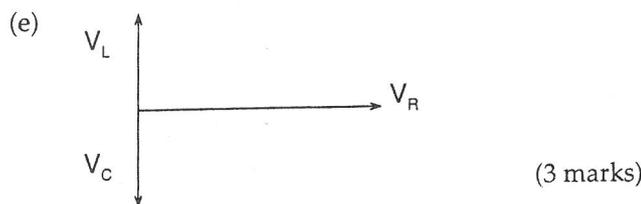
(c) at resonance $X_L = X_C$, $\omega_L = \frac{1}{\omega_C}$ (1 mark)

$\omega = \sqrt{\frac{1}{LC}}$ $f = \frac{1}{2\pi\sqrt{LC}}$ (1 mark)

$= \frac{1}{2\pi(0.20 \times 8.0 \times 10^{-5})^{\frac{1}{2}}}$ (1 mark)
 $= 39.7887 \text{ Hz}$

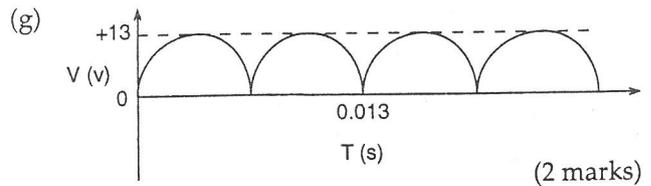
(2 for equation only)
(1 mark for substitution)

(d) $V_L = IX_L$ (1 mark)
 $= I \times \omega \times L$
 $= 0.060 \times 2\pi \times 39.7887 \times 0.20$
 $= 2.999$
 $= 3.0 \text{ V}$ (1 mark)



2 marks for correct orientation of voltages, 1 mark
for V_L and V_C same length.

- (f) C increases, X_C decreases (1 mark)
 V_C decreases, V_S will lead current (1 mark)



1 mark for shape and 13V peak and 4 lumps
1 mark for 0.013 s period

Question Nine: Sound (13 marks)

Part 1

(a) $\lambda = \frac{v}{f}$ (1 mark)
 $= \frac{330}{600}$
 $= 0.55 \text{ m}$ (or 0.550 or 0.6) (1 mark)

(b) $t = \frac{d}{v}$ (1 mark)
 $= \frac{400}{330}$
 $= 1.212$
 $= 1.2 \text{ s}$ (or 1.21 or 1) (1 mark)

(c) 606 and 594 Hz (1 mark each)

- (d) Decreased (1 mark)
 Each crest/compression a little further away, so
time between received crests longer
(or λ stretched) and so received frequency is
lower. (1 mark)

Part 2

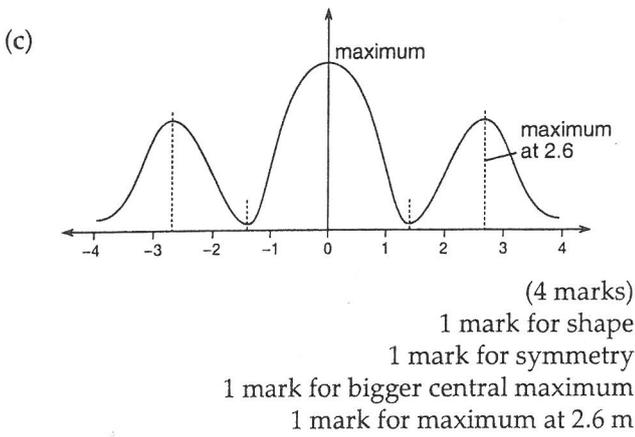
(e) $d = 2 \times 99 \text{ m}$, $v = \frac{d}{t}$ (1 mark)
 $= 2 \times \frac{99}{0.130}$ (1 mark)
 $= 1523.1$
 $= 1500 \text{ ms}^{-1}$ (1 mark)

- (f) Refraction (1 mark)
 with explanation (1 mark)
 or partial reflection from boundaries with
explanation (2 marks)
 or velocity changes and so estimated d will
change. (2 marks)

Question Ten: Electromagnetic Radiation (15 marks)

(a) $f = \frac{v}{\lambda}$
 $= \frac{c}{\lambda}$ (1 mark)
 $= \frac{3.0 \times 10^8}{1.0 \times 10^{-3}}$ (1 mark)
 $= 3.0 \times 10^{11} \text{ Hz}$ (1 mark)

(b) $n\lambda = \frac{dx}{L}$ $d = \frac{Ln\lambda}{x}$ (1 mark)
 $= \frac{280 \times 1 \times 1.0 \times 10^{-3}}{2.6}$
 $= 0.1077$
 $= 0.11 \text{ m}$ (1 mark)



(d) $X = \frac{n\lambda L}{d}$
 d increases, X decreases, so moves closer to axis (1 mark)

(e) $n\lambda = d \sin \theta$ (1 mark)
 $d = \frac{n\lambda}{\sin \theta}$
 $= \frac{3 \times 4.6 \times 10^{-7}}{\sin(30)}$ (2 marks)
 $= 2.76 \times 10^{-6} \text{ m}$

(f) $d = 2.76 \times 10^{-6} \text{ m line}^{-1}$
 $\frac{1}{d} = 3.623 \times 10^5 \text{ lines m}^{-1}$
 $= 3.62 \times 10^3 \text{ cm}^{-1} \text{ or } 3.62 \times 10^5 \text{ m}^{-1}$ (2 marks)

Question Eleven: Atomic Physics (12 marks)

(a) $KE = hf - \phi$ (1 mark)
 $= 6.626 \times 10^{-34} \times 3.5 \times 10^{15} - 6.4 \times 10^{-19}$ (1 mark)
 $= 1.6791 \times 10^{-18}$ (use 6.63 to get 1.6805×10^{-18})
 (or 2 marks if concern expressed)

(b) $KE = \frac{1}{2}mv^2$ (1 mark)
 $v = \sqrt{\frac{2KE}{m}}$
 $= \left(\frac{2 \times 1.6805 \times 10^{-18}}{9.1 \times 10^{-31}} \right)^{\frac{1}{2}}$
 $= 1.9 \times 10^6 \text{ ms}^{-1}$ (1 mark)

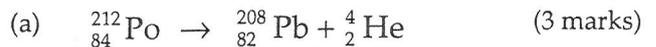
(c) Visible (1 mark)

(d) The photon emitted when the electron lands on n = 3 (1 mark)
 has more energy (1 mark)
 and since $E = hf$ it has a higher frequency. (1 mark)

(e) $\Delta E = \frac{hcR}{4^2} - \frac{hcR}{1^2}$ or other valid equation (1 mark)
 $= hcR \left(\frac{1}{16} - \frac{1}{1} \right)$
 $= 2.0 \times 10^{-18} \text{ J}$ (1 mark)

(f) $E = hf, f = \frac{E}{h}$ (1 mark)
 $= \frac{2.044 \times 10^{-18}}{6.626 \times 10^{-34}}$
 $= 3.0853 \times 10^{15}$
 $= 3.1 \times 10^{15}$ (or 3.0) Hz (1 mark)

Question Twelve: Nuclear Physics (13 marks)



(b) $E = mc^2$ (1 mark)
 $= 0.016 \times 10^{-27} (3.0 \times 10^8)^2$ (1 mark)
 $= 1.4 \times 10^{-12} \text{ J}$

(c) $200 \times 10^6 \times 1.6 \times 10^{-19}$ (1 mark)
 $= 3.2 \times 10^{-11} \text{ J}$ (1 mark)

(d) $E = Pt$ (1 mark)
 $= 6.5 \times 10^8 \times 6.48 \times 10^6$
 $= 4.2 \times 10^{15} \text{ J}$ (1 mark)

(e) number of fissions $= \frac{4.212 \times 10^{15}}{3.2 \times 10^{-11}}$ (1 mark)
 $= 1.3 \times 10^{26}$ (1 mark)

(f) $E = mc^2$ $\Delta m = \frac{E}{c^2}$
 $= \frac{4.2 \times 10^{15}}{(3.0 \times 10^8)^2}$
 $= 4.7 \times 10^{-2} \text{ kg}$

So, no (1 mark)
 47 grams is insignificant. (1 mark)

